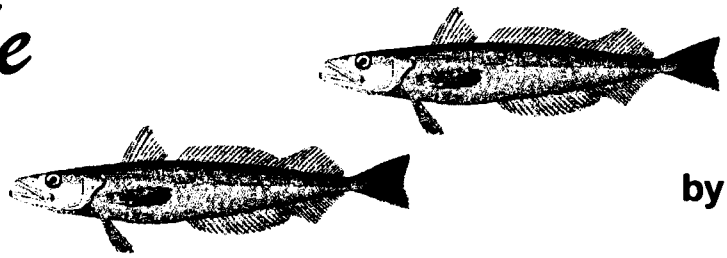
Silver Hake



by R.K. Mayo

The silver hake or whiting, *Merluccius bilinearis*, is a slender, swiftly swimming fish with a range extending from Newfoundland to South Carolina. Silver hake are important predators, feeding on fish, shrimp, and occasionally squid. In U.S. waters, two stocks have been identified based on morphological differences; the Gulf of Maine-Northern Georges Bank stock, and the Southern Georges Bank-Middle Atlantic stock. Silver hake undertake extensive migrations, moving towards shallow water in the spring, where spawning occurs during late spring and early summer, and returning to deeper areas in autumn. Silver hake from the northern stock overwinter in deeper waters of the Gulf of Maine, while individuals from the southern stock overwinter along the outer continental shelf and slope.

Major spawning areas include the coastal region of the Gulf of Maine from Cape Cod to Grand Manan Island, southern and southeastern Georges Bank, and the southern New England area south of Martha's Vineyard. Peak spawning occurs earlier in the southern stock (May and June) than in the northern stock (July and August). More than 50 percent of age 2 fish (20 to 30 cm, 8 to 12 in.), and nearly all age 3 fish (25 to 35 cm, 10 to 14 in.) are sexually mature. Silver hake grow to a maximum length of around 65 cm. Ages up to 15 years have been reported, but few fish older than age 6 have been observed in recent years.

Its abundance and availability have made silver hake important to the U.S. and Canada as well as to distant-water fleets. Following entrance of distant-water fleets to the fishery in 1962, nominal catches from both stocks increased rapidly to a peak of over 350,000 mt in 1965, but declined to only 55,000 mt by 1970. Landings then increased to 137,000 mt in 1973 and then declined sharply with inception of the Magnuson Fishery Conservation and Management Act (MFCMA)in 1977. Prior to MFCMA, distant-water fleets accounted for about 49% and 87% of total landings for the northern and southern stocks, respectively. Fishing activity by distant-water fleets ceased after 1977 for

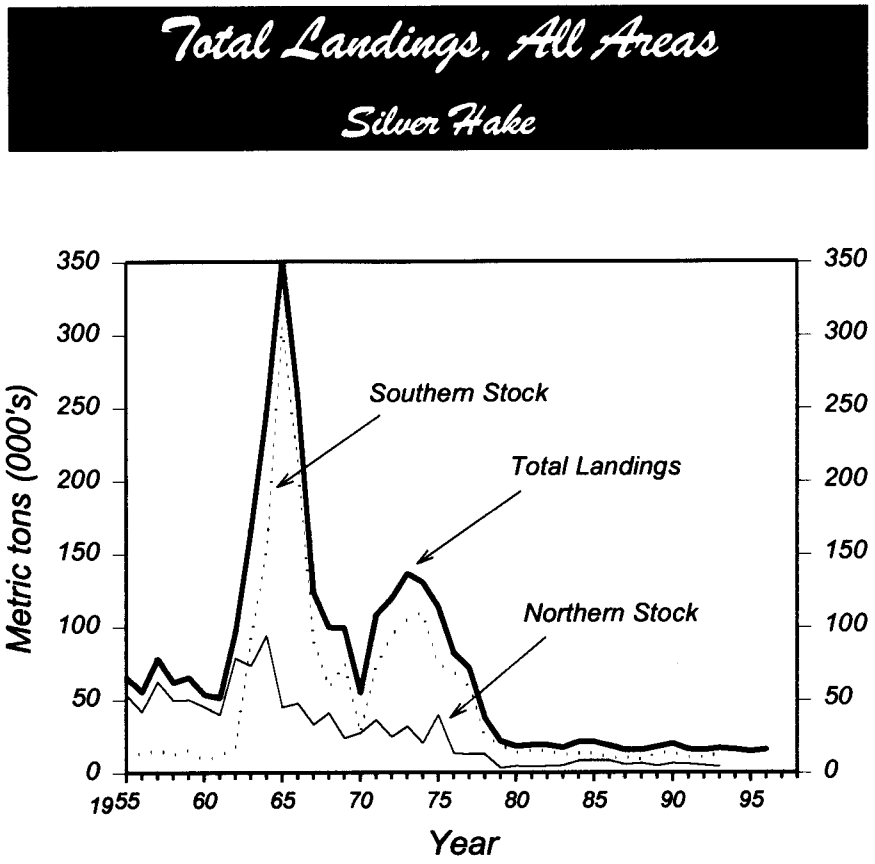


Table 4.1 Recreational catches and commercial landings (thousand metric tons)

Category	Year										
	1977-86 Average	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
U.S. recreational	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Commercial											
United States	18.8	15.7	16.0	17.8	20.0	16.2	15.6	17.2	16.1	14.7	16.2
Canada	-	-	-	-	-	-	-	-	-	-	-
Other	7.7	-	-	-	-	-	-	-	-	-	-
Total nominal catch	26.9	15.7	16.0	17.8	20.0	16.2	15.6	17.2	16.1	14.7	16.2

"Recently, a 'juvenile' whiting fishery has developed in response to an export market for small silver hake that have traditionally been discarded."

the northern stock, but exploitation of the southern stock by distant water fleets continued until 1987, primarily as bycatch in the squid fishery. U.S. landings during the last decade have remained stable, but low compared to earlier years of the fishery, averaging 16,600 mt per year.

The otter trawl remains the principal gear used in the U.S. fishery. Recreational catches since 1985 have been insignificant. Silver hake are included within the New England Fishery Management Council's Multispecies Fishery Management Plan ("nonregulated multispecies" category).

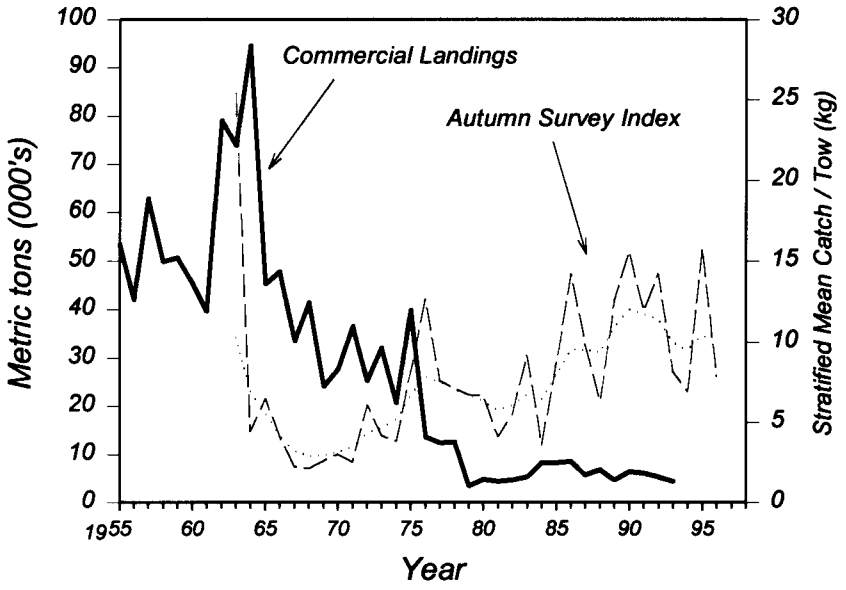
Recently, a "juvenile" whiting fishery has developed in response to an export market for small silver hake that have traditionally been discarded. Concerns have been raised about the impact of this fishery on the resource and on traditional whiting fisheries.

Gulf of Maine-Northern Georges Bank

The NEFSC autumn bottom-trawl survey biomass index declined during the period of heavy exploitation by distant-water fleets, reaching a minimum in 1967-68. With the appearance of the strong 1973 and 1974 year classes, biomass indices increased during the mid-1970s, but declined slightly during the late 1970s. Biomass indices have again increased since 1980 and recent recruitment appears to be at or above that of the mid-1970s.

Gulf of Maine-Northern Georges Bank

Silver Hake



Summary Status

Long-term potential catch	=	Unknown
SSB for long-term potential catch	=	Unknown
Importance of recreational fishery	=	Insignificant
Management	=	Multispecies FMP
Status of exploitation	=	Overexploited
Age at 50% maturity	=	1.7 years (both sexes)
Size at 50% maturity	=	22.3 cm (8.8 in.), males 23.1 cm (9.1 in.), females
Assessment level	=	Index
Overfishing definition	=	31% MSP
Fishing mortality rate corresponding to overfishing definition	=	$F_{31\%} = 0.36$

M = 0.40 **$F_{0.1}$ = 0.39** **F_{1996} > 1.0**

During 1973-1982, fishing mortality rates on fully recruited fish (age 3+) derived from virtual population analysis (VPA) fluctuated between 0.38 and 1.1, and generally increased from 1982 (0.45) through 1988 (0.70). Although VPA fishing mortality estimates are not available for subsequent years, total mortality estimates based on NEFSC survey abundance indices suggest that since 1992 fishing mortality has doubled, from about 0.7 (42% exploitation rate) to 1.4 (65% exploitation rate).

Substantial mortality of age 1 and 2 (<25 cm) fish has occurred through discarding in the large mesh (>5.5 inch mesh) and small mesh (<3.5 inch mesh) otter trawl fisheries and in the northern shrimp fishery.

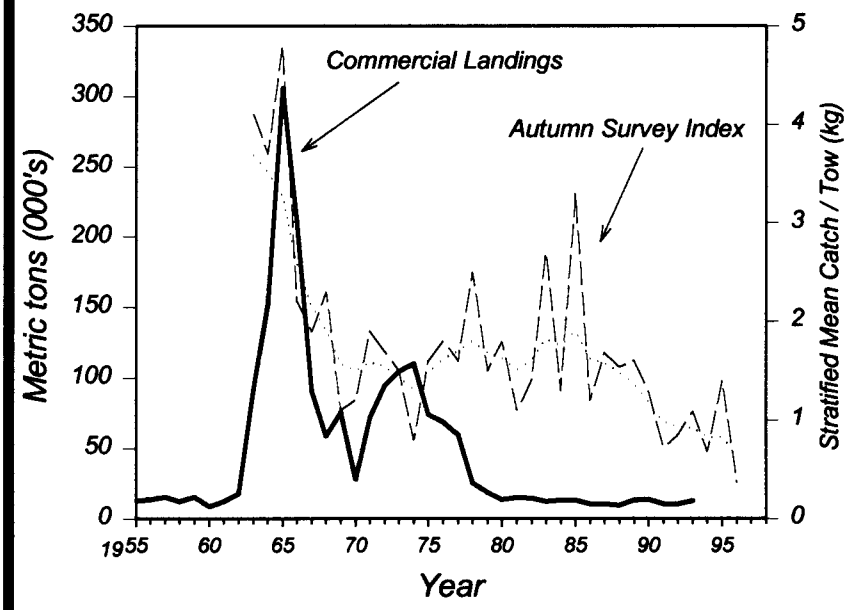
"...high discard mortality on juvenile fish results in substantial losses in long term yield and spawning biomass."

Annual discard estimates over the 1989-1992 period ranged from 1,700 mt to 7,200 mt. In terms of numbers of fish, the quantities of discarded silver hake have been quite large, ranging from 17 million to 76 million fish per year. This high discard mortality on juvenile fish results in substantial losses in long term yield and spawning biomass.

Bottom-trawl survey indices suggest that biomass has remained at or above pre-1975 levels over the past 15 years, but substantial increases in recruitment in recent years have not translated into an increase in mature fish biomass (age 3+). Until this inconsistency is resolved, the precise level of exploitation remains uncertain. However, since it is not likely that fishing mortality will decline substantially in the near future to below the overfishing definition level ($F_{31\%}$ = 0.36, 25% exploitation rate), and given the rapid removal of recruits from the stock in recent years, this stock must be considered overexploited.

Southern Georges Bank - Middle Atlantic

Silver Hake



Summary Status

Long-term potential catch	=	Unknown
SSB for long-term potential catch	=	Unknown
Importance of recreational fishery	=	Minor
Management	=	Multispecies FMP
Status of exploitation	=	Overexploited
Age at 50% maturity	=	1.6 years (both sexes)
Size at 50% maturity	=	22.7 cm (8.9 in.), males 23.2 cm (9.1 in.), females
Assessment level	=	Index
Overfishing definition	=	42% MSP
fishing mortality rate corresponding to overfishing definition	=	$F_{42\%} = 0.34$

M = 0.40 **$F_{0.1}$ = 0.45** **$F_{1996} > 1.0$**

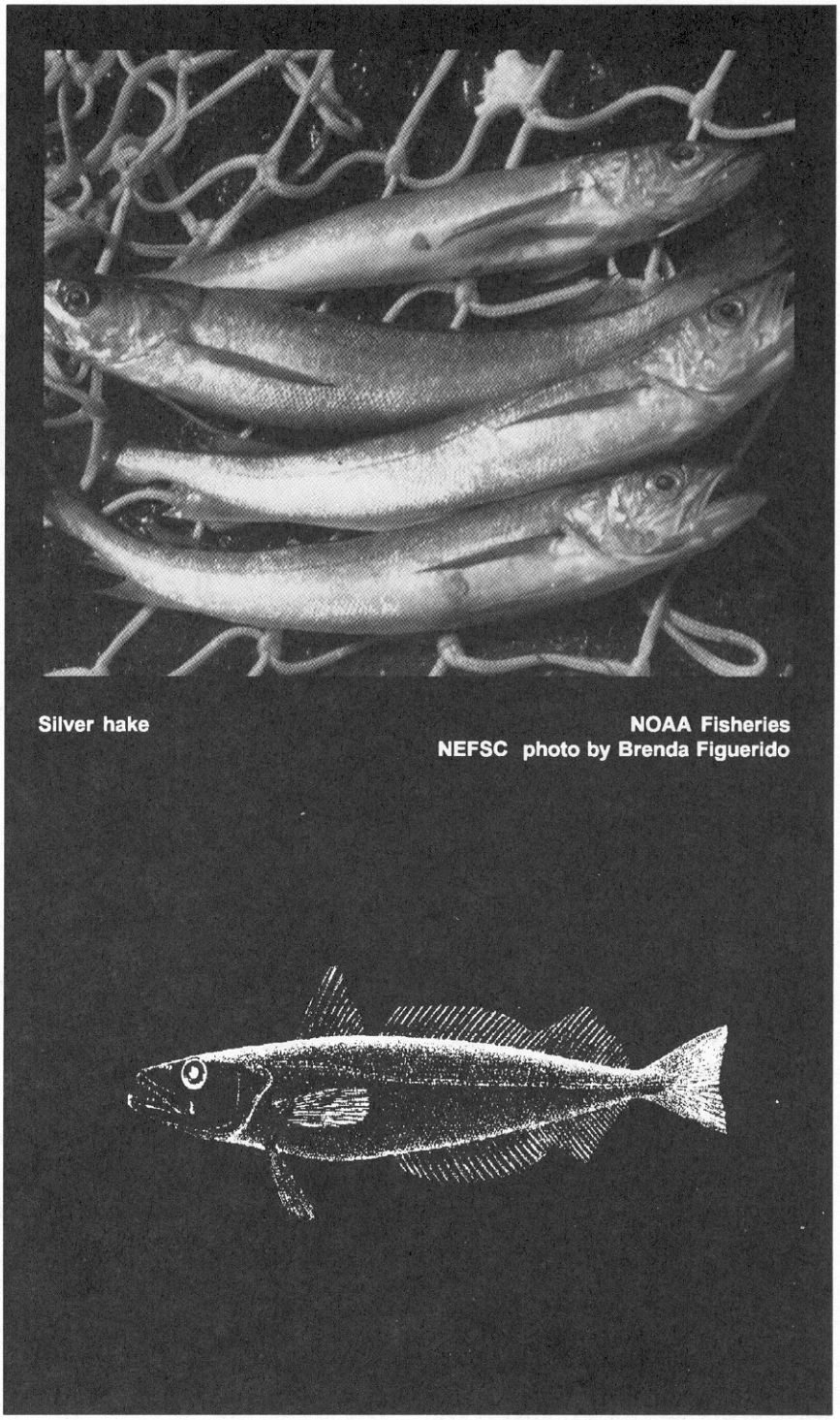
The NEFSC autumn bottom trawl survey biomass index has declined by over 50% since 1985, and survey indices in the past three years have been at or near record lows.

Between 1955 and 1962, fishing mortality was relatively low, ranging from 0.09 to 0.41 (average = 0.24, 18% exploitation rate). With increased effort by distant-water fleets, F rose rapidly and reached 0.98 in 1965. Fishing mortality decreased to 0.5 (33% exploitation rate) during 1978-1980 and then again increased to over 1.0 (54% exploitation rate) during 1983-1987. Although VPA estimates of fishing mortality and stock size are not available from 1988 onward, total mortality estimates based on NEFSC survey data suggest that F has been close to 1.2 (60% exploitation rate) in recent years.

Significant mortality of age 1 and 2 (<25 cm) fish has occurred through discarding in the large mesh (>5.5 inch mesh) and small mesh (<3.5 inch) otter trawl fisheries. Annual discard estimates over the 1989-1992 period ranged from 1,300 mt to 10,000 mt. The estimated numbers of fish discarded have been quite high, ranging from 10 million to 81 million fish per year. This high discard mortality on juvenile fish results in substantial losses in long term yield and spawning biomass.

"The stock is overfished and will remain so until the exploitation pattern is improved (*i.e.*, catches of juveniles are minimized) and fishing mortality is markedly reduced."

NEFSC bottom trawl survey results indicate that stock abundance is low and continues to decline. Age structure of the population is severely truncated, with few fish older than age 4. Although landings are relatively low compared to historical levels, F has steadily increased since 1980, generally exceeding 1.0 during the 1990s. Fishing mortality remains far above the level corresponding to the overfishing definition ($F_{42\%}$ = 0.34, 24% exploitation rate). The stock is overfished and will remain so until the exploitation pattern is improved (i.e., catches of juveniles are minimized), and fishing mortality is markedly reduced.



Silver hake

NOAA Fisheries
NEFSC photo by Brenda Figuerido

For further information

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